The data attached provides a data set to analyse the demand for money in the US. The data represent a sample observed over the period 1950.Q1-2000.Q4. The description of the variables (all seasonally adjusted) in the file is given below

M1= real money supply.

INF = inflation rate.

REALGDP=real GDP.

TBILRATE = treasury bills (proxy for interest rates).

Questions

Use the data to answer the following questions

Q1. Plot the time series of all the variables. Describe and discuss dynamics of the data. How

does money supply dynamics compare to the other three variables?

[5 Marks]

Q2. Estimate the static demand for money equation below:

𝑙𝑚𝑡 = 𝛽0 + 𝛽1𝑖𝑛𝑓𝑡 + 𝛽2𝑙𝑦𝑡 + 𝛽3𝑡𝑏𝑖𝑙𝑟𝑎𝑡𝑒𝑡 + 𝑢𝑡

(1)

where 𝑙𝑚𝑡

is natural log of real money supply, 𝑙𝑦𝑡

is the natural logarithm of real gdp, 𝑢𝑡

is

the error term and t is a subscript referring to time.

a) Estimate model (1) above using OLS. Report the estimation output.

b) Carefully interpret the estimated coefficients including the intercept. Are the signs of

the coefficients consistent with what you expect? Explain your reasoning.

c) Perform tests for the statistical significance of the coefficients of the independent

variables inflation, real GDP and interest rates using critical values corresponding to

the t-distribution and the test p-values. Carefully state the null and alternative

hypotheses. Interpret your results.

[12 Marks]

Q3. Answer all parts

a) Perform a joint significance test for the independent variables of the model using the

critical values corresponding to the F-distribution and the test p-values. Carefully

state the null and alternative hypotheses. Interpret your results.

b) Comment on the goodness of fit of the model.

[5 Marks]3

Q4. Answer all parts

a) Provide a graphical analysis of the residuals to detect the presence of autocorrelation

using at least two different plots. Do you find evidence of autocorrelation? Explain

your reasoning?

b) What are the consequences of autocorrelation on the OLS estimator?

c) Test for autocorrelation in the residuals using an appropriate procedure.

[10 Marks]

Q5. Suppose money supply in equation (1) is not directly observed and we have the long run

demand for money. The desired level is defined as follows:

𝑙𝑛𝑀𝑡 − 𝑙𝑛𝑀𝑡−1 = 𝛿(𝑙𝑛𝑀𝑡

∗ − 𝑙𝑛𝑀𝑡−1) (2)

a) How does the model in equation (1) change?

b) State and estimate the new specification. Interpret the estimation output.

c) Based on part (b) above, what is the speed of adjustment to the long run level?

d) Using the new specification, derive the long run static model. How does it compare

to the estimated specification based on equation (1).

[10 Marks]

Q6. Test for autocorrelation in the residuals (from the regression in Q5) using an appropriate

procedure.

[5 Marks]

Q7. The presence of real GDP, inflation, and lagged dependent variable in the specification

in Q5 may lead to an endogeneity issue.

a) Explain and discuss what is the issue of endogeneity in the context of this question.

b) What are the implications of the presence endogeneity on OLS?

c) How would you account for the presence of endogeneity?

[8 Marks]

Q8. Estimate the model in Q5 using Two Stage Least Squares (TSLS). Answer the following

questions:

a) Define the set of instruments used to estimate the model. Justify the reasons of your

selected set of instruments.

b) Compare the qualitative and statistical interpretation of the TSLS estimated model to

that estimated using OLS in Q5. Which model is more consistent and conform to

theory?

c) Using this specification and TSLS estimates, derive the long run static model. How

does it compare to (i) the estimated specification based on equation (1) in Q2 and (ii)

to that derived based on (Q5-d).

[12 Marks]

Q9. The model estimated in Q2 may be spurious due to the presence of unit roots. 4

a) Perform the ADF unit root test on all variables in equation (1). State clearly the

hypothesis being tested, the data generating process, the lag length selection criterion

and the critical values. Are there evidence that the data contain a unit root?

b) What is the order of integration of the variables tested in part (a).

c) Perform the Engle-Granger cointegration test. Are the variables cointegrated? State

clearly hypothesis being tested, the data generating process, the lag length selection

criterion and the critical values.

[15 Marks]

Q10. Discuss how your findings can be useful to policy makers. What policy implications can

be drawn from this analysis?

[8 Marks]